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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/757,269	01/08/2001	David K. Umberger	10003127-1	6246

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HEWLETT-PACKARD COMPANY
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EXAMINER

BANANKHAH, MAJID A

ART UNIT	PAPER NUMBER
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2127

DATE MAILED: 06/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

3

Office Action Summary

Application No.

09/757,269

Applicant(s)

UMBERGER ET AL.

Examiner

Majid A Banankhah

Art Unit

2127

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01-08-01.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This office action is in response to application filed on January 08, 2001. Claims 1-20 are considered for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 in line 3 recites: "identifying a plurality of operation awaiting execution at at least one service component of said data processing system". It is unclear whether the service components are being executed or the operations are being executed on the service components.

Claim 1 in line 5-6 recites: "**at run time**, assigning an initial priority ranking to each of said plurality of components **prior to run time**". It is unclear priority is assigned at run time or prior to run time.

Claim 1 recites: "at run time" in the second step. It is unclear "run time" is related to the data processing system or operation waiting execution.

In claim 2, the first paragraph is so vague that it does not permit understanding of the limitation. Service demand is placed on service components and yet it is arising from performance of said plurality of operations. The relationship between performance and service

Art Unit: 2127

demand is indefinite. Applicant's attempt to write overly broad claim, makes the claim so incomprehensible that it does not permit understanding of the claim. Performance of an operation makes determination on the demand of the service!

The second paragraph of the claim is incomprehensible. The limitation of "adjusting said assigned priority ranking at run time to substantially equalize said utilization rate" is unclear. Equalizing is the function of making equal, two objects or properties between the two objects. Here however, the utilization rate is equalized but it is unclear in compare with what other utilization rate?

Claims 3-8 are rejected for similar reasons stated in the rejection of claims 1 and 2.

Claim 10, the statement "for prioritizing work requests affecting data stored " is ambiguous". It is unclear work request is related to what other elements in the claim. Related to host device, communication with hierarchical storage device or what other element in the claim. In claim 10, still the relationship between work request, host device and/or hierarchical storage device is unclear. Is work request, coming from host device causes the request to be put on hierarchical storage or they are two different requests?

Claims 11-15 are rejected for similar reasons stated in the rejection of claims 9-10.

Additionally, claim 15 is dependent on claim 15. It is unclear which claim it is dependent from.

Claim 17 is rejected because in line 2-3, it is unclear priority is assigned to which code request, i.e. code for transferring or code for migration.

Art Unit: 2127

3. Following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3-5, 9, 10-12, 16, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Belhadj et al. (U.S.Pat. No. 6,516,425, hereinafter Belhadj) in view of Courtright, II et al. (U.S.Pat. No. 6,157,963, hereinafter Courtright).

While claims 1-15, were rejected under 35 USC 112, second paragraph as stated above (Section 2, *supra*), in order to advance prosecution, claims will be treated on the merits in view of examiner's best understanding of the disclosure and the prior art.

Per claims 1, and 9, Belhadj teaches: a method for optimizing an efficiency of a data processing system, the method comprising the steps of (the system of Belhadj):
identifying a plurality of operations awaiting execution at at least one service component of said data processing system (disk array 15 to coordinate data transfer to and from the storage disks 20, col. 5, lines 65 to col. 6, line 17);
at run time, assigning an initial priority ranking to each of said plurality of operations prior to run time (calculated rebuild prioritization determined, holds any currently executing rebuild, col. 12, line 63 to col. 13, line 8); and

Art Unit: 2127

While the reference of Belhadj teaches of assigning priority to each of the operation and teaches of rebuild prioritization in the instance of disk failure at run time, he fails to teach modifying said assigned initial priority rankings at run time to optimize efficiency of said data processing system. However, changing priority at run time in order to increase efficiency is well known in the art as it is evidenced by Courtright, II et al. (col. 8, lines 63 to col. 9, line 11) for the reason that real time operations don't have to wait and also give low priority requests a chance so they don't starve (See Courtright, col. 1, lines 31-51). Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to use priority changing method of Courtright into RAID system of Belhadj in order to increase efficiency and reduce wait time for high priority requests.

Per claim 16, regarding the data transferring data block between the RAID and data migration between levels of RAID, see Belhadj col. 5, line 65 to col. 6, line 17, and col. 7, lines 38-55.

Per claim 3, the method of claim 1 wherein said plurality of operations comprise operations internal to said at least one service component and operations external to said at least one service component (See Belhadj, col.), the method further comprising the step of: selecting one of an internal operation and an external operation for execution from said plurality of operations based on a utilization rate of said at least one service component (Belhadj, col. 4, lines 11-25, data migration between levels and data transfer between RAID, and col. 5, line 65 to col. 6, line 17).

Art Unit: 2127

Per claim 4, the method of claim 3 wherein said selecting step comprises:
directing said at least one service component to execute said operations external to said at least one service component when said utilization rate is below a pre-determined threshold (See Belhadj, col. 4, line 65 to col. 6, line 17).

Per claim 5, the method of claim 4 wherein said directing step comprises:
adjusting priority rankings of said external operations so as to surpass priority rankings of said internal operations (Courtright, II et al. (col. 8, lines 63 to col. 9, line 11).

Per claim 10, the claim is rejected for the reasons stated in the rejection of claim 9 and further, a request queue in communication with said priority manager for storing work requests incoming from said host device and from said at least one hierarchical storage device is taught by Belhadj in col. 6 line 53 to col. 7, line 7 (data structure necessary for managing the controller cluster).

Per claim 11, the claim is rejected for the reasons stated in the rejection of claim 10 and further, external work requests describing a data transfer operation between said at least one hierarchical storage device and said host device (See Belhadj, col. 4, line 65 to col. 6, line 17); and internal work requests describing a data transfer operation between different levels in said at least one hierarchical storage device (Courtright, II et al. (col. 8, lines 63 to col. 9, and line 11).

Per claim 12, the claim is rejected for the reasons stated in the rejection of claim 10 and further, a utilization evaluator for calculating utilization rates of said at least one hierarchical storage device based upon said stored work requests in said request queue is taught by Belhadj, col. 4,

Art Unit: 2127

lines 11-25(data migration between levels and data transfer between RAID), and col. 5, line 65 to col. 6, line 17.

Per claims 17 and 18, claims are rejected for the reasons stated in the rejection of claim 16 and further,

code for establishing an initial priority for work requests including said code for transferring and work requests including said code for migrating (calculated rebuild prioritization determined, holds any currently executing rebuild, col. 12, line 63 to col. 13, line 8), wherein said work requests including said code for transferring are transfer work requests and said work requests including said code for migrating are migrating work requests, Belhadj col. 5, line 65 to col. 6, line 17, and col. 7, lines 38-55. Additionally, code for determining a service demand imposed upon said RAID storage device based on said transfer work requests and said migrating work requests (see, Belhadj, col. 5, line 65 to col. 6, line 17, and col. 7, lines 38-55).

5. Claims 2, 6-8, 13-15 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Belhadj et al. (U.S.Pat. No. 6,516,425, hereinafter Belhadj) in view of Courtright, II et al. (U.S.Pat. No. 6,157,963, hereinafter Courtright), further in view of Pecone et al. (U.S.Pat. No. 6,012,123, hereinafter Pecone).

Per claim 2, the modified reference of Belhadj fails to teach of estimating utilization rate based on service demand to be used for priority assignment. However, estimating the utilization rate is well known in the art as it is evidenced by Pecone. The reference of Pecone teaches of a throughput performance estimate in which the I/O performance of a RADI is estimated for the reason to improve efficiency of RADI storage (See Pecone, col. 3, lines 40-55). Therefore, it

Art Unit: 2127

would have been obvious for one ordinary skill in the art at the time the invention was made to use throughput performance estimate method of Pecone into the system of Belhadj in order to set priority arrangement according to the latest estimated reduce wait time for high priority requests to increase efficiency.

Per claims 6 and 7, the method of claim 1 wherein one of said plurality of service components is a hierarchical storage device (See Belhadj, Title) and said -plurality of operations comprise operations internal to said storage device and operations occurring between said storage device and a host device (Belhadj, col. 4, lines 11-26) and wherein said selecting step comprises the step of:

at run time, selecting one of an operation internal to said storage device and an operation occurring between said storage device and said host device based on a utilization rate of said storage device (See Pecone, col. 3, lines 40-55).

Per claim 8, the method of claim 7 wherein said selecting step comprises the step of: causing said hierarchical storage device to execute substantially only said direct data transfer operations when a utilization rate of said hierarchical storage device is below a predetermined threshold (See Pecone, col. 3, line 40-55, throughput above certain limit).

Per claim 13, the claim is rejected for the reasons stated in the rejection of claim 9 and further, a workload identifier for identifying each of a plurality of workloads; a performance demand associated with each of said plurality of workloads, thereby establishing a plurality of

Art Unit: 2127

performance demands is taught by the reference of Pecone who teaches of a throughput performance estimate in which the I/O performance of a RADI is estimated for the reason to improve efficiency of RADI storage (See Pecone, col. 3, lines 40-55); and an initial priority ranking associated with each of said plurality of workloads, thereby establishing a plurality of initial priority rankings (See Belhadj, calculated rebuild prioritization determined, holds any currently executing rebuild, col. 12, line 63 to col. 13, line 8).

Per claim 14, the claim is rejected for the reasons stated in the rejection of claim 13 and further, a ranking controller for adjusting, at least one of said initial priority ranking in order to service a performance demand of at least one of said plurality of workloads is taught by Courtright, II et al. In col. 8, lines 63 to col. 9, line 11, and See Courtright, col. 1, lines 31-51.

Per claim 15, the claim is rejected for the reasons stated in the rejection of claim XX (claim is dependent on itself) and further, a service level guarantee associated with one of said performance demand for establishing a minimum level of service for said one of said performance demand is taught by Pecone where he teaches of a throughput performance estimate in which the I/O performance of a RADI is estimated for the reason to improve efficiency of RADI storage (See Pecone, col. 3, lines 40-55).

Per claim 19, the claim is rejected for the reasons stated in the rejection of claim 18 and further,

Art Unit: 2127

code for modifying said established initial priority for said transfer work requests and said migrating work requests based upon said determined service demand is taught by Pecone col. 3, lines 40-55.

Per claim 20, the claim is rejected for the reasons stated in the rejection of claim 18 and further, code for adjusting said established initial priority to substantially equalize utilization rates at at east two of said different RAID storage levels (see Courtright, II et al. col. 8, lines 63 to col. 9, line11 and Courtright, col. 1, lines 31-51).

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Majid A. Banankhah** whose voice telephone number is (703) 308-6903. A voice mail service is also available at this number.

All response sent to U.S. Mail should be mailed to:

Commissioner of Patent and Trademarks

Washington, D.C. 20231

Hand-delivered responses should be brought to Crystal Park Two, 2021 Crystal Drive, Arlington. VA, Six Floor (Receptionist). All hand-delivered responses will be handled and entered by the docketing personnel. Please do not hand deliver responses to the Examiner.

All Formal or Official Faxes must be signed and sent to either (703) 308-9051 or (703) 308-9052. Official faxes will be handled and entered by the docketing personnel. The date

Art Unit: 2127

of entry will correspond to the actual FAX reception date unless that date is a Saturday, Sunday, or a Federal Holiday within the District of Columbia, in which case the official date of receipt will be the next business day. The application file will be promptly forwarded to the Examiner unless the application file must be sent to another area of the office, e.g., Finance Division for fee charging, etc.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.

Maid Banankhah

5/17/04


MAID BANANKHAH
PRIMARY EXAMINER